To:
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Argonne National Laboratory

Re; Argonne Symposium November 5-6, 2004

From:
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To Whom It May Concern:

The research project I was involved in took place in the summer of 2003 and was a part of the program formally known as the Research Experience for Undergraduates (REU). It has been directed by professor Mark Hersam (Department of Materials Science and Engineering at Northwestern) and supported by National Science Foundation. The topic of my research was: *Precipitation Strengthening of Al(Sc,Ti) Alloys,* my faculty mentor was: Professor David Swidman from Materials Science and Engineering Department at Northwestern University, and my graduate mentors were: Marsha Van Dalen and Richard Karnesky.

Abstract

This study investigated the precipitation strengthening of the binary Al-0.14wt% Sc, 0.16% Ti alloy system. Ingots of Al-2.1wt% Sc and Al-4.68wt% Ti were melted together and the nucleation, growth, and coarsening of precipitates were analyzed. The microstructural evolution of the nanoscale $L1_2$ precipitates phase were examined with Vickers microhardness testing, transmission electron microscopy (TEM), and three-dimensional atom probe (3DAP). The chemical identities of the individual atoms, as well as the mechanical properties of the ternary alloy annealed at 300^oC for hours, were thus measured. Careful examination of the 3DAP data and the concentration profiles of the analyzed Al(Sc,Ti) alloy proved that the Ti partitioned and/or substituted into the $Al_3(Sc)$ precipitate. This Ti propagation decreased the lattice mismatch between the Al matrix and the $Al_3(Sc_{1-x}Ti_x)$ precipitates. It was hoped that the study would determine if the partitioning of the Ti in the system would decrease the coarsening rate and increase the creep resistance properties of the alloy, but further analysis of the alloy at higher temperatures and longer aging times is required, as the microhardness values of the Al-0.14wt% Sc, 0.16% Ti were not considerably augmented in comparison with the Al-0.1wt% Sc binary two-phase alloy system previously studied.